Section 4 — Compliance and Market Activity

Sources achieved over 99 percent compliance with the NO_x Budget Trading Program (NBP) in 2005. This section examines compliance under the NBP in 2005 and reviews allowance trading and pricing trends in this maturing market. In addition, this section reviews the monitoring and control methods employed by sources to meet program requirements.

2005 Compliance Results

Under the NBP, sources must hold sufficient allowances to cover their ozone season nitrogen oxides (NO_x) emissions each year. Sources can maintain the allowances in compliance accounts (established for each unit) or in an overdraft account (established for each facility with more than one unit). The sources have a 2-month period following the end of the control period to buy or sell allowances and/or move allowances between accounts to ensure their emissions do not exceed allowances held. After the 2-month period, EPA reconciles emissions with allowance holdings to determine program compliance. Sources may not transfer allowances until annual reconciliation is complete.

There were 2,570 units affected under the NBP in 2005. Only three NBP sources (4 units total) did not hold sufficient allowances to cover their emissions. Table 4 summarizes the allowance reconciliation process for 2005.

Table 4: NO_x Allowance Reconciliation the Summary for the NO_x Budget Trading Program, 2005

Total Allowances Held for Reconciliation (2003 through 2005 Vintages)	729,326
Allowances Held in Compliance or Overdraft Accounts	700,782
Allowances Held in Other Accounts*	28,544
Allowances Deducted in 2005	534,005
Allowances Deducted for Actual Emissions	529,830
Additional Allowances Deducted under Progressive Flow Control (PFC)	4,168
Termination of 2004 Early Reduction Credits (or Compliance Supplement Pool) Allowances**	7
Banked Allowances (Carried into 2006 Ozone Season)	195,321
Allowances Held in Compliance or Overdraft Accounts	160,604
Allowances Held in Other Accounts***	34,717
Penalty Allowances Deducted**** (from Future Year Allocations)	12

* Other Accounts refers to general accounts in the NO_x Allowance Tracking System (NATS) that can be held by any source, individual, or other organization, as well as state accounts.

** Compliance supplement pool (CSP) allowances can only be used for 2 years. CSP allowances not used for reconciliation in 2005 have been retired permanently.

*** Total includes 6,173 new unit allowances returned to state holding accounts.

**** These penalty deductions are made from future vintage year allowances, not 2005 allowances. An additional 264 penalty allowances are owed by one source and will be deducted in the future.

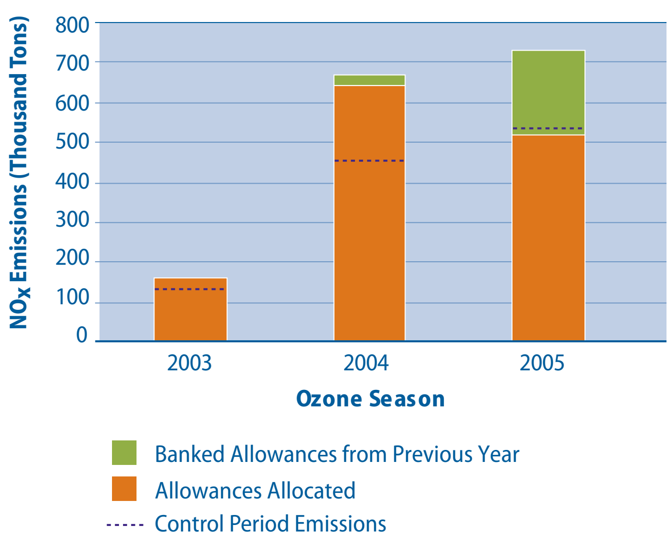
Banking in 2005 and Flow Control in 2006

Under cap and trade programs in general, and the NBP specifically, banking allows companies to decrease emissions below the amount of allowances they hold and then save the unused allowances for future use. Banking results in environmental and health benefits earlier than required and provides an available pool of allowances that could address unexpected events, or smooth the transition into deeper emission reductions.

Figure 17 shows the number of allowances allocated each year, the allowances banked from the previous year, and the total ozone season emissions for NBP sources from 2003 to 2005. Sources banked over 195,000 allowances in the 2005 ozone season (see Table 4), which will be available for use in 2006 for program compliance. This is about 6 percent lower than the nearly 208,000 allowances sources banked by the end of the 2004 ozone season, which were available for use in 2005 (as shown in Figure 17).

The NBP's progressive flow control provisions were designed to discourage extensive use of banked allowances in a particular ozone season. Flow control is triggered when the total number of allowances banked for all sources exceeds 10 percent of the total regional budget for the next year. When this occurs, EPA calculates the flow control ratio by dividing 10 percent of the total regional NO_x trading budget by the number of banked allowances (a larger bank will result in a smaller flow control ratio). The resulting flow control ratio establishes the percentage of banked allowances that can be deducted from a source's account on a ratio of one allowance per ton of emissions. The remaining banked allowances, if used, must be deducted at a rate of two allowances per one ton of emissions. In 2005, the flow control ratio was 0.25, and 4,168 additional allowances were deducted from the allowance bank under the flow control provisions. Flow control will be triggered again in 2006, at a slightly higher ratio of 0.27 (see "Flow Control Will Apply in 2006," page 29, for details).

Figure 17: NO_x Allowance Allocations and the Allowance Bank, 2003–2005



Notes:

- The 2003 emissions and allocations totals includes only the OTC states. The 2004 emissions total includes the OTC states emissions (from May 1 to September 30) plus the non-OTC states emissions (from May 31 to September 30).
- Allowances allocated include base budget, compliance supplement pool (CSP), and opt-in allowances. CSP allowances may not be used beyond the 2005 ozone season. For more information on allowance allocations, visit www.epa.gov/airmarkets/fednox.

Source: EPA

Flow Control Will Apply in 2006 — How Will It Affect Sources?

2006 Regional Budget:	520,957 Allowances
Banked Allowances after 2005:	195,321 Allowances
Flow Control Trigger:	195,321/520,957 = .375 (> than 10 percent), Triggering Flow Control for 2006

- The 2006 flow control ratio = 0.27 (determined by dividing 10 percent of the total regional trading budget by the total number of banked allowances, or 52,096/195,321).
- The flow control ratio applies to banked allowances in each source's compliance and overdraft allowance accounts at the time of compliance reconciliation. For example:
  - If a source holds 1,000 banked allowances at the end of 2006, it can use 270 of those allowances on a 1-for-1 basis and the remaining 730 allowances on a 2-for-1 basis.
  - If the source used all 1,000 banked allowances for 2006 compliance, the banked allowances could cover only 635 tons of NO_x emissions (i.e., 270 + 730/2).

NO_x Allowance Trading in 2005

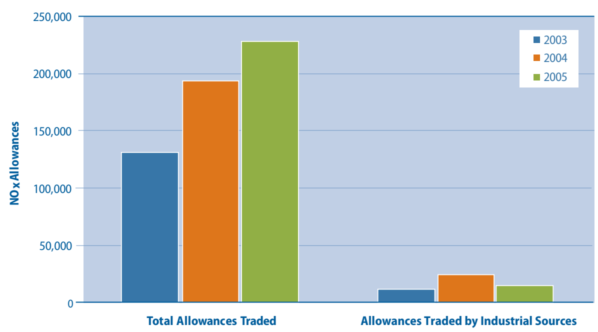
There are three main types of allowance transactions:

- Transfers within a company or between related entities (e.g., holding company transfers to a small operating subsidiary), including transfers between a unit compliance account and any account held by a company with an ownership interest in the unit.
- Transfers between separate economic entities. This may include companies with contractual relationships such as power purchase agreements, but excludes parent-subsidiary types of relationships. These transfers are categorized broadly as "economically significant trades."
- Transfers from or to a state as allowance allocations or allowance surrenders.

In 2005, economically significant trades represented about 30 percent of the total transfers between entities other than a state. There were approximately 228,000 allowances involved in economically significant trades in 2005, an increase of about 34,000 allowances from 2004 (see Figure 18). The economically significant trades provide a strong indicator of true market activity, because they represent an actual exchange of assets between unaffiliated participants.

Industrial sources accounted for over 6 percent of the economically significant trade volume in 2005, which was down from 2004 levels. This level of activity is proportional to the industrial units' regional emissions contribution of slightly less than 7 percent. The high level of 2004 trading activity for industrial sources was the result of a significant number of allowances purchased by this group of sources. In 2005, that trend was reversed as the industrial sources transferred far more allowances to others than they received. In most trades, industrial sources are trading with electric generating companies, with only a few trades involving industrial sources on both sides of the transaction.

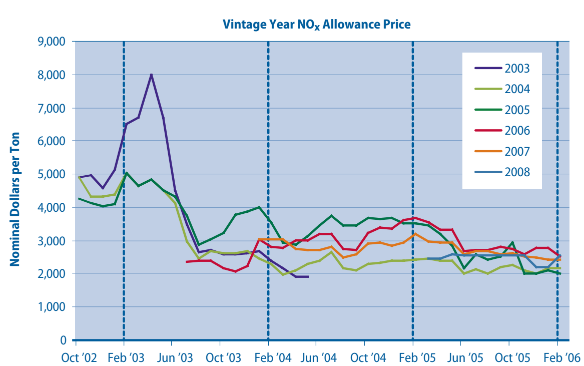
Figure 18: Estimated Volumes of Economically Significant Trades under the NO_x Budget Trading Program, 2003–2005



Note: As part of compiling this information for the 2005 report, EPA has reexamined all allowance transfer data from 2003 and 2004, and has revised the numbers for 2003 and 2004 presented in previous reports. Generally, EPA's estimate of economically significant trade volume in those years has decreased based on further analysis of outside data sources (such as company Web sites and Securities and Exchange Commission filings) to identify corporate relationships and ownership interests in units. The 2003 data also have been adjusted to correct a computational error. Because trades are not reported by market participants with respect to whether they are economically significant, EPA presents these data as a general estimate only.

Source: EPA

Figure 19: Vintage Year NO_x Allowance Prices by Month of Sale for the NO_x Budget Trading Program



Source: Evolution Markets, LLC and Cantor Environmental Brokerage

NO_x allowance prices in 2005 were slightly lower and somewhat less volatile than during 2004 (see Figure 19). Potential reasons for the price decline may include sources' need to use remaining compliance supplement pool (CSP) allowances before their 2005 expiration and increased confidence from understanding the impacts of the Clean Air Interstate Rule (CAIR) finalized in March 2005. In addition, the general price differential between vintage years 2004 and 2005 versus 2006 through 2008 reflects the discount applied to banked allowances as a result of flow control.

NO_x allowance prices can reflect market uncertainties as companies evaluate ongoing trends in control installations, energy demand, and other external factors that affect the overall costs of control. Additional influences on allowance pricing include progressive flow control and integration with other emission control programs, such as CAIR.

Continuous Emission Monitoring System (CEMS) Results

In order for NO_x allowances to be accurately tracked and traded, NBP sources must use consistent emissions monitoring procedures to determine their emissions. Accurate and consistent monitoring ensures that all allowances in the NBP have the same value (i.e., a ton of NO_x emissions from one NBP source is equal to a ton of NO_x emissions from any other source in the program). Sources are required to conduct stringent quality assurance tests of their monitoring systems, such as daily calibrations, quarterly linearity checks, and semi-annual or annual relative accuracy test audits (RATAs). These tests not only verify that the monitoring systems are measuring accurately, but also compare measured data to a standard reference method. Analysis of the quality-assured CEMS data reported by NBP sources in 2005 convincingly demonstrates the accuracy of the emission data.

In 2005, both the electric generating units and industrial units passed at least 98 percent of the quality assurance tests required of their monitoring systems. Industrial sources, many of which have only been monitoring under EPA's detailed monitoring procedures (40 CFR Part 75) since 2003, were able to perform at nearly the same level as electric generating units, many of which have been monitoring under Part 75 for more than a decade.

The NBP sources reported quality-assured emission data for more than 99 percent of their operating hours in 2005. Part 75 requires conservatively high substitute data values to be reported for missing data periods, but substitute data were used less than 1 percent of the time in 2005 and therefore had little impact on the NO_x emissions reported by NBP sources.

Monitoring Options Available to Sources

EPA has developed detailed procedures (40 CFR Part 75) to ensure that sources monitor and report emissions with a high degree of precision, accuracy, reliability, and consistency. Coal-fired units are required to use CEMS for NO_x and stack gas flow rate (and if needed, CO_2 or O_2 and moisture), to measure and record their NO_x emissions. Oil- and gas-fired units may alternatively use a NO_x CEMS in conjunction with a fuel flowmeter to determine NO_x emissions. For oil- and gas-fired units that are either operated infrequently to provide power during periods of peak demand, or that have very low NO_x emissions, Part 75 provides low-cost alternatives to CEMS for estimating NO_x emissions.

Compliance Options Used by NO_x Budget Trading Program Sources in 2005

Sources may select from a variety of compliance options to meet the emission reduction targets of the NBP in ways that best fit their own circumstances, such as:

- Decreasing or stopping generation from units with high NO_x emission rates, or shifting to lower emitting units, during the ozone season.
- Using NO_x combustion controls that modify or optimize the basic combustion process to control the formation of NO_x.
- Using add-on emission controls, such as selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR).
- Purchasing additional allowances from other market participants whose emissions were lower than their allocations.

Before implementation of the NBP, a large number of electric generating units and some industrial units added combustion controls to meet applicable NO_x emission limits of either the Acid Rain Program (ARP) or state regulations. For boilers, furnaces, and heaters, NO_x combustion controls include low NO_x burner and overfire air technologies, which modify the combustion process to reduce formation of NO_x from nitrogen found in the combustion air and fuel.

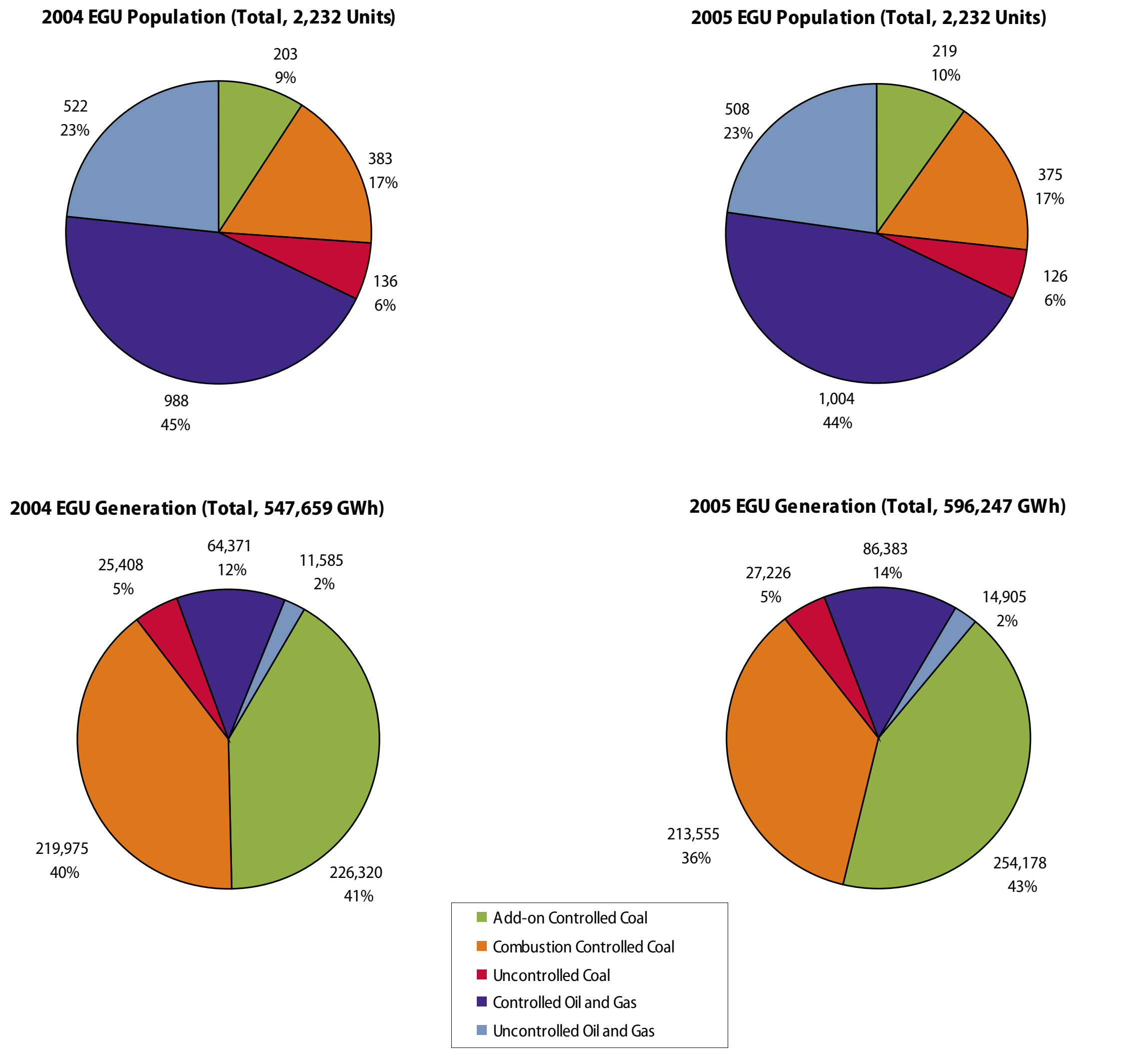
Add-on control technologies, such as SCR or SNCR, have also been frequently installed for NO_x control. The majority of units that install add-on controls use them in conjunction with their existing combustion controls to achieve greater emission reductions. SCR and SNCR are control technologies that achieve NO_x reductions by injecting ammonia, urea, or another NO_x -reducing chemical into the flue gas downstream of the combustion unit to react with NO_x, forming elemental nitrogen (N_2) and water. SCR, which adds a catalyst to allow the reaction to occur in a lower temperature range, can be applied to a wider range of sources than SNCR and is capable of greater NO_x removal rates.

NO_x Controls Used in 2005

Sources subject to the NBP are required to report pollution control equipment information, including installation dates, in monitoring plans submitted to EPA. For this report, EPA verified the source-reported EPA emission control equipment data with state agencies, with an emphasis on coal-fired units, to confirm the findings.[10]

[10] Two affected states are still gathering data; all others have provided updated control status information.

Figure 20: Number of Affected Electric Generating Units (EGUs) and Percent of Total Ozone Season Electric Generation by Fuel and Control Type for 2004 and 2005



Note: Add-on controls for coal units include SCR and SNCR. Combustion controls include various low NO_x burner control technologies, over-fire air, water injection, and others.

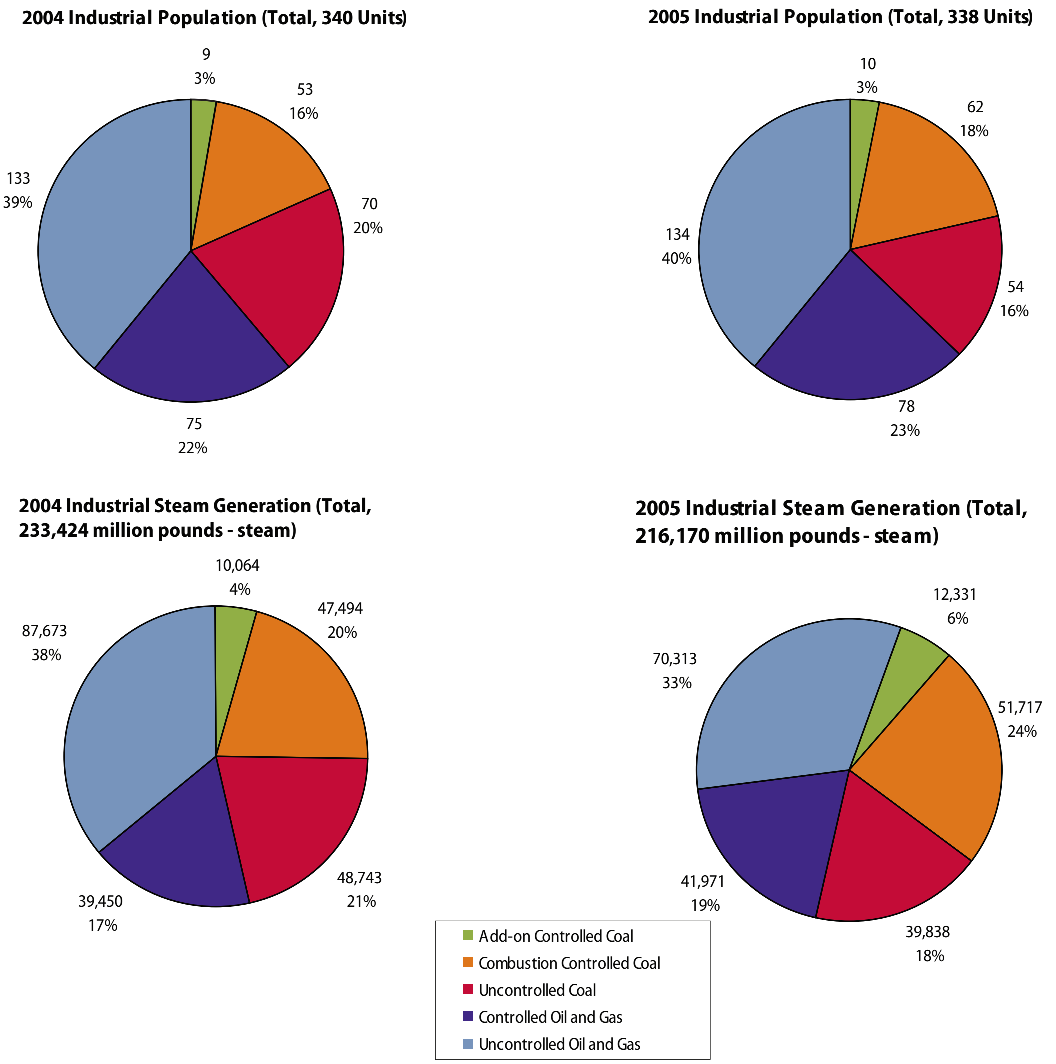
Source: EPA

EPA used the input from the state agencies to update data where needed. EPA continues efforts to verify that control equipment data are accurate and complete.

Figure 20 shows the breakdown of how electric generating units have employed emission controls as of the 2005 ozone season compared to the 2004 ozone season. The charts include the results broken down both by number of units and by the percent of total ozone season generation.

In the 2005 ozone season, there were 2,232 electric generating units affected under the NBP. The results show that although the number of coal-fired units with NO_x emission controls (i.e., add-on controls and/or combustion controls) represents less than 30 percent of the total number of electric generating units, this sector represented almost 80 percent of total generation. Uncontrolled units, either coal or gas and oil, represent about one-third of all units, but less than

Figure 21: Number of Affected Industrial Units and Percent of Total Ozone Season Steam Output by Fuel and Control Type for 2004 and 2005



Source: EPA

10 percent of the total generation.

Figure 21 shows similar information for industrial units based on steam output rather than electric generation. In the 2005 ozone season, there were 338 industrial coal-fired units affected under the NBP. Based on reported monitoring plan data, it appears that only about 3 percent of the industrial coal-fired units use add-on NO_x controls; there were no cases where a coal-fired industrial unit reported using SCR. Except for turbines that can use a relatively simple form of SCR, the technology is typically limited to larger coal-fired electric generating units that can achieve significant emission reductions in a cost-effective way.

Overall, the number of electric generating units and industrial units with NO_x controls increased from the 2004 to the 2005 ozone season. For example, the number of controlled coal-fired units (which includes units that added combustion and/or add-on controls) increased by 18 from 2004 to 2005. The majority of coal-fired units with new add-on controls in 2005 had pre-existing combustion controls.

Focus on Acid Rain Program Units in the NBP

EPA conducted a study that examined the NO_x rate performance of 465 units in the NBP region. These units were selected for this study because they were also required under 40 CFR Part 76 of the Acid Rain Program to meet NO_x emission rate limits. The specific group of units for this study consisted of dry bottom wall fired and tangentially fired boilers which had NO_x combustion controls in both the 2000 and 2005 ozone seasons but did not have add-on controls at the start of 2000. This study first quantified the average ozone season NO_x rate reductions among this group of units between 2000 (when the Phase II limits took effect) and 2005. Next, EPA examined how these units achieved those reductions. For this study, EPA used reported control equipment data, and then contacted a subgroup of about 60 units to obtain more specific information on the methods used to lower NO_x rates. The results are summarized below.

Reductions in Average NO_x Rates Between 2000 and 2005

Between 2000 and 2005, the average ozone season NO_x emission rate for all 465 units decreased by more than 50 percent, while the units' heat input remained comparable. The average ozone season NO_x rate for wall-fired boilers dropped by 55 percent, while tangentially fired boilers achieved reductions of 47 percent. In 2005, both wall-fired and tangentially fired boiler types operated at emission rates below the limits set in Part 76. The graph and table summarize the NO_x rate reductions by boiler type.

Source: EPA

Unit Type	ARP Phase II NO_x Rate limits (lb/mmBtu)	2000 Average Ozone Season NO_x Rate (lb/mmBtu)	2005 Average Ozone Season NO_x Rate (lb/mmBtu)	Percent Reduction from 2000 to 2005
All Units (465)	NA	0.403	0.194	52%
Dry Bottom Wall-Fired Boilers (221)	0.46	0.432	0.193	55%
Tangentially Fired Boilers (244)	0.40	0.373	0.196	47%

How Sources Achieved These Reductions

Based on the reported control equipment data and the additional contact with a subset of sources, EPA found that out of 465 units:

- 154 units installed add-on controls (SCR or SNCR). Between the 2000 and 2005 ozone seasons, the average NO_x rate for this group of units declined by 70 percent (from 0.416 to 0.123 lb/mmBtu) from their levels prior to installing add-on controls. This is equal to a decrease of over 267,000 tons of NO_x emissions.
- 311 units operated with existing, modified, and/or additional advanced NO_x combustion controls. Between the 2000 and 2005 ozone seasons, the average NO_x rate for this group of units declined by 26 percent (from 0.388 to 0.288 lb/mmBtu). This is equal to a decrease of over 82,000 tons of NO_x emissions. From the telephone contact, EPA found that several approaches were used by these sources including: installing advanced low NO_x burner technology; adding overfire air or coal reburn; and optimizing existing low NO_x burners and modifying boiler characteristics, such as air-to-fuel ratio. In addition, sources noted the co-benefits from blending or switching to sub-bituminous coals.